CTSW-RT-02-020

FINAL REPORT

LEVEL SPREADER EFFECTIVENESS EVALUATION

CALIFORNIA DEPARTMENT OF TRANSPORTATION
SACRAMENTO, CALIFORNIA

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Level Spreader Effectiveness Evaluation May 2002

Final Report

CTSW-RT-02-020

Prepared for:

Caltrans Environmental Program
Office of Environmental Engineering
Sacramento, California

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1.0 INTRODUCTION

This report summarizes a study (Contract 43A0034, Task Order No. 6) Caltrans conducted to assess the feasibility and effectiveness of the level spreader as a temporary construction best management practice (BMP). The evaluation consisted of a literature review and an assessment of 42 Caltrans construction sites to determine which, if any, were suitable for implementation of a level spreader BMP. Based on the results of the literature and site reviews, the study team has concluded that the level spreader BMP is not suitable for use as a temporary construction site BMP, and should be rejected from further study and from consideration as a temporary BMP for Caltrans construction sites. The following sections are included in this summary report.

- Section 2: background information
- Section 3: the results of the data collection and review
- Section 4: the results of the site evaluations
- Sections 5 and 6: findings and conclusions regarding the feasibility of level spreader use as a temporary construction site BMP

2.0 PROJECT BACKGROUND

To comply with the provisions of the National Pollutant Discharge Elimination System (NPDES) permit issued by the State Water Resources Control Board, Caltrans developed the Statewide Storm Water Management Plan (SWMP) (August 2001) where best management practices and implementation criteria to reduce impacts to water quality are described. As part of the submittal, the State Water Resource Control Board requested that Caltrans provide, within one year of approval of the SWMP, adequate justification to reject, limit or omit the level spreader as a viable BMP on construction sites (Section 4.5.1). In accordance with this request, Caltrans has undertaken a study to assess the use, effectiveness, and feasibility of installation of the level spreader BMP at Caltrans construction sites.

3.0 DATA COLLECTION AND REVIEW

Existing data on the use and effectiveness of level spreaders were collected from a review of publications and internet sites, and discussions with regulatory and construction industry personnel. The results of the literature review are summarized in Table 1. Level spreader installation is discussed in detail below.

3.1 TYPICAL USE

Level spreaders are structures that are installed at points of concentrated storm water discharge. Level spreaders disperse the concentrated storm water over wide, relatively flat slopes so that erosion from concentrated runoff is minimized. The level spreader is generally considered an energy dissipation device that may also facilitate the settlement of suspended solids because it reduces runoff velocity. This BMP is not a treatment device. The level spreader can be used in conjunction with other treatment BMPs, such as grassy swales, to treat storm water. The literature suggests that level spreaders are not typically utilized as temporary construction BMPs,

but are primarily implemented as permanent structures to control runoff after the final grading operation and pavement installation.

3.2 TYPICAL DESIGN CRITERIA

Level spreaders are hydraulic conveyance systems that are constructed at a uniform elevation (zero grade) across a slope. The level spreader consists of a vegetated or mechanical lip or weir installed at surface grade that disperses (spreads) the water flow across a gentle slope. For construction applications, use of a mechanical lip constructed of timber, asphalt, or concrete would be preferred because those materials are likely to be durable. The structure must be installed in an undisturbed or finished area, should be level, and should disperse onto a vegetated slope that has a gradient of less than 1:10 (V:H). At a minimum, the final 6 meters (20 feet) of the conveyance structure entering the level spreader should have a finished gradient of less than 1:100. The lip can be constructed of either stabilized grass for low flows, or timber/concrete for higher flows. Typically, the minimum length for the level spreader lip is 2 meters (6 feet). The length of the level spreader lip is dependent on the volume of water that must be discharged. Typical rules-of-thumb are that storm water passing over the weir should be limited to a depth of approximately 0.15 meters (6 inches) and a velocity of approximately 0.3 meters per second (1 foot/sec). A drainage area of two hectares is considered to be the upper limit for a typical level spreader to operate at maximum efficiency.

For proper operation, runoff entering the level spreader must not contain significant amounts of sediment. Therefore, an upstream sediment removal BMP may be required in addition to the level spreader. Use of a sediment removal BMP in conjunction with a temporary level spreader would most likely be necessary at active construction sites where earth-disturbing activities are being performed.

3.3 TYPICAL MAINTENANCE AND COST

The level spreader should be inspected after each rainfall event. The spreader lip needs to be kept level and free of sedimentation at all times. The lip must also be maintained so that water flow is spread evenly. For level spreaders with vegetated lips, the grass needs to be kept alive to provide erosion protection. Mechanical lips need to be inspected on a regular basis to ensure proper operation. Vegetation downslope of the level spreader must be maintained so that erosion does not occur.

Costs to install a typical level spreader were not available in the literature reviewed. The study team has estimated installation costs to be between $3,000 and $5,000, depending on the physical setting at the selected site. The majority of costs are likely to be related to installation labor rather than the materials used to construct the spreader. Maintenance costs are expected to be highly variable, and dependent on the materials used, the level of site activity, and the severity of the rainy season.

Very few of the documents reviewed contained level spreader performance assessment data. Of the 30 publications reviewed, 20 contained a discussion regarding level spreaders and only 4 provided effectiveness information. None of the publications reviewed contained quantitative evaluations of level spreader effectiveness for erosion reduction or energy dissipation. In one study documenting the use of a level spreader in combination with a 50-meter vegetated filter

strip, total suspended solids and inorganics were reduced by up to 84 and 50 percent, respectively. The other three publications with effectiveness data documented removal efficiencies of 25 to 40 percent for various constituents.

4.0 SITE EVALUATION RESULTS

Using information compiled from the reviewed literature, active construction projects were evaluated to identify sites where the level spreader could be constructed and monitored during the 2001-2002 rainy season. Candidate construction sites were selected based on the following criteria:

- Projects on the Caltrans May 20, 2001, Statement of Ongoing Contracts,
- Projects scheduled to last through the end of the rainy season (April 2002),
- Projects involving soil-disturbing activities including construction and landscaping projects (paving, lighting, and guardrail projects were eliminated from consideration), and
- Projects with construction costs greater than $500,000.

Using these criteria, a list of 42 active construction sites was established for possible site visits. The sites were located throughout California, with most located in the southern part of the State. Following discussions with each site's resident engineer, 33 sites were selected for actual site visits and consideration for the effectiveness evaluation.

Criteria for selecting sites for use in the level spreader effectiveness evaluation were developed using standards established in Caltrans' 1997 Planning and Design Staff Guide, the 2000 Construction Site Best Management Practices Manual, and the information gathered during our literature review. Prior to initiating site visits, a standard evaluation checklist was developed. Each site was evaluated to determine its suitability for level spreader implementation as follows:

- The installed level spreader must be usable during the 2001-2002 rainy season,
- The level spreader must discharge storm water as sheet flow to a vegetated slope of less than 1:10 (V:H),
- Storm water entering the level spreader must be free of significant amounts of sediment, and
- The tributary area for the storm water should be less than two hectares.

5.0 FINDINGS

A total of 33 sites were visited after making arrangements with the resident engineer. The site visits consisted of evaluating the feasibility of installing a level spreader. The evaluation checklist was used to record the findings of the inspection. Photographs of existing facilities and potential installation locations were taken. Table 2 summarizes the findings of the site visits.

Field investigations revealed that none of the 33 construction sites visited had an installed level spreader BMP. Additionally, Caltrans construction personnel that were interviewed on site were not aware of a level spreader installed at any active Caltrans construction site. Review of the 33 active sites found no sites that appeared to be suitable for installation of a level spreader BMP

according to the design and installation criteria identified during this study. The construction sites reviewed typically did not have storm water discharge points situated in locations where a well vegetated, moderate slope existed. Many of the sites are projects in an urban setting, where storm water runoff discharges into limited spaces and/or existing storm water handling (conveyance) structures.

6.0 CONCLUSIONS

Based on the result of the literature and site reviews, the following can be concluded regarding use of level spreaders as a BMP for construction sites:

- Most existing level spreader literature documents permanent installations and final site conditions. The literature did not provide information for temporary construction applications.
- Based on reviewed literature, the level spreader is an energy dissipation BMP and is not effective in removing soil sediments.
- The level spreader requires a primary sediment control BMP upstream to prevent sediment from entering the level spreader and compromising its effectiveness.
- The Construction BMP Handbook lists a total of 45 construction site BMPs. Of those, 21 BMPs have been identified as viable erosion control BMPs including other types of energy dissipation BMPs such as rip rap, straw bales, and gravel bags. Rejection of the level spreader BMP would not affect a contractor's ability to control concentrated flow erosion on Caltrans' construction sites.
- Level spreaders require specific and somewhat unique site conditions for installation. A detailed review of 42 major Caltrans construction projects found no suitable locations for the installation of a level spreader BMP.
- Caltrans typically purchases only enough right-of-way for the footprint of the project. Level spreaders require large, relatively flat areas to be effective. The typical construction site may not have sufficient right-of-way to accommodate the installation of a level spreader BMP.
- All Caltrans projects must incorporate minimum design pollution prevention BMPs with respect to water quality. These design goals include minimizing impervious surfaces, preventing downstream erosion, stabilizing disturbed soil areas, and minimizing disturbance of vegetated surfaces. To satisfy these goals most projects are designed with 1:2 (V:H) slopes for soil stability and minimization of highway footprint areas. Level spreaders require longer, gentler slopes (1:10 or less) in order to be effective. Therefore, level spreader installation might require a larger construction footprint, and more disturbance of surrounding soil and vegetation, than would otherwise be necessary.

The study team concludes that these findings provide adequate justification to reject the use of the level spreader as a temporary construction site BMP for all Caltrans construction sites.

TABLE 1

LITERATURE REVIEW
LEVEL SPREADER EFFECTIVENESS EVALUATION

Document	Date Published	Information (Y/N)	Design Parameters	Effectiveness Assessment
Stormwater Management Volume Two: Stormwater Technical Handbook, MA Department of Environmental Protection	3/1/97	Y	Level spreaders are only briefly discussed as appurtenances to other stormwater management structures.	No Information Available
Processes, Procedures, and Methods to Control Pollution Resulting From All Construction Activity, USEPA	10/1/73	Y	Describes siting of spreader but no design details.	No Information Available
Engineering and Design Handbook for the Preparation of Stormwater Pollution Prevention Plans for Construction Activities, USACE	2/28/97	Y	Provides a table of spreader dimensions based on flow rate, transition to spreader must have 1% slope or less, depth of spreader at least 155 mm (6.10 in).	No Information Available
Washington State Department of Ecology Stormwater Management Manual for Western Washington. Vol II. Construction Pollution Prevention	8/1/00	Y	Discharge area below outlet must be uniform with slope=5H:1V; constructed in undisturbed soil; runoff shall not concentrate after relapse unless intercepted by another downstream measure; channel grade for last 6.10 m (20') of dike or interceptor entering level spreader <=1%; level spreader grade=0%; 150 mm (6") high gravel berm placed across the level lip shall consist of washed crushed rock 50-100 mm (2-4 in.) or 20-40 mm (.75-1.5 in.) in size; spreader length determined by peak flow of 10yr-24hr storm; minimum spreader length=4.5m (15') for 0.0028 cms (0.1cfs) and 3 m (10') for each 0.0028 cms there after to a max. of 0.014 cms (0.5 cfs) per spreader; spreader width=1.8 m (6') min and uniform across entire length. Materials that can be used include sandbags, lumber, logs, concrete, pipe (as long as material is installed level and on contour).	No Information Available
Catalog of Stormwater BMPs, State of Idaho Dept. of Environmental Quality		Y	Not for construction use. A level spreader by itself is not considered a pollutant reduction device, it improves the efficiency of other facilities, such as vegetated swales, filter strips, or infiltration devices, which are dependent on sheet flow to operate properly.	Level spreader effectiveness was evaluated as <25% removal for metals, bacteria, petroleum hydrocarbons.
Stormwater Managers Resource Center Web Page, Article 118, Level Spreader/ Filter Strip System Assessed in Virginia, www.stormwatercenter.net/practice/118-Filter%20in%20virginia.pdf.		Y	Experimental design: inflow distribution box collected runoff from 4 hectare (10 acre) paved area and routed 10 watershed-mm (0.4") of runoff into a 180 m (600') earthen v-shaped trench (3 m width, 1 m depth (10', 3')). Concrete weir installed at downslope lip of trench served to evenly spread runoff overflows across a 46 m (150') grass filter strip with an avg. 6% slope, and composed of Kentucky 31 Tall Fescue.	Pollutant removal rates for level spreader/filter strip combination were evaluated and found removal rates TSS 84%, Nitrate+Nitrite 20%, P 40%, Pb 50%, Zn 55%. No data for level spreader alone are given.

TABLE 1

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Document	Date Published	Information (Y/N)	Design Parameters	Effectiveness Assessment
North Carolina Division of Land Resources, Land Quality Section Web Page, www.dlr.enr.state.nc.us/ vol5no1sed2.html.		Y	No Information Available	Reductions of turbidity of 30-40% were seen in preliminary study data from level spreaders at construction sites. Study is ongoing.
Sediments, Newsletter of the N. C. Sedimentation Control Commission, Vol 5, No 1	1/98-3/98	Y	Provides a table of spreader dimensions based on flow rate, transition to spreader must have 1% slope or less.	No Information Available
Franklin, E. C., J. D. Gregory, J. E. Parsons and D. W. Hazel. Management of Forested Filter Zones for Dispersion and Treatment of Agricultural Runoff. Departments of Forestry and Biological and Agricultural Engineering, N. C. State University. January 2000. Report 312.	2000	Y	(No specific parameters. Information taken from the study's abstract). Trenched level spreader, receiving runoff dispersed by a distribution box, was tested for its ability to disperse storm flows over a large area of a forested filter zone receiving agricultural runoff.	Natural storm flow events showed a large decrease in peak flow rate. Results also showed large effects of dispersion in total storm flow and in peak flow rate. Water quality results showed that dispersion of storm flow greatly reduced TSS, ammonia nitrogen and o-phosphate. Showed small improvements for removing nitrate nitrogen, TKN and total P. Authors conclude that their level spreader design is more versatile in application and more effective than the earlier designs currently recommended by Natural Resources Conservation service from removing sediment from field runoff.
Natural Resources Conservation Service, Conservation Practice Standard, Level Spreader, Code No. 870, www.lrc.usace.army.mil/co-r/level%20spreader.pdf.	1992	Y	Must use in conjunction with filter strip. Do not exceed 0.85 cms (30 cfs) flow. Minimum length of 2 m (6') Construct 6 m (20') transition from ditch to spreader. 10% max downslope.	No Information Available
EPA Office of Wastewater Management, Construction Site Storm Water Runoff Control, Tetratech Web site, www.tetratech-test.com/ bmpmanual/htmfolder/site_22.htm		Y	Describes siting of spreader, but gives no design details.	No Information Available

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Document	Date Published	Information (Y/N)	Design Parameters	Effectiveness Assessment
EPA Office of Water, Watershed Protection Web Page, Watershed Protection Techniques, Vol 1, No. 2 Summer 1994, Technical Notes-Urban Best Management Practices, Technical Note 18, www.epa.gov/OWOW/NPS/wpt/wpt02/wpt02-18-18.html	1994	Y	Spreader is described as part of a agricultural stormwater runoff pollution removal system. The system was effective at P and sediment removal, but data for the spreader alone is not given.	No Information Available
USDA Planning and Design Manual for the Control of Erosion, Sediment, and Stormwater, First Edition, grapevine.abe.msstate.edu/csd/p-dm	4/1/94	Y	Provides a table of spreader dimensions based on flow rate, transition to spreader must have 1% slope or less.	No Information Available
Los Angeles County Department of Public Works Web Page, Best Management Design Criteria, dpw.co.la.ca.us/epd/wq/susmp/B-12.pdf	5/17/00	Y	Provides design criteria for use of a spreader as part of a vegetated filter strip.	No Information Available
Guidance Manual for On-Site Stormwater Quality Control Measures, Sacramento Stormwater Management Program, Web Page, www.sacstormwater.org/const/manuals/pdf/on-site_chap4.pdf.	1/1/00	Y	Provides a table of spreader dimensions based on flow rate, transition to spreader must have 1% slope or less, slope of outlet must be less than 10%, depth of spreader must be at least 150 mm (6").	No Information Available
Stormwater Pollution Prevention Code of Practice for Local, State and Federal Government, South Australia EPA, www. Environment.sa.gov.an/epa/pdfs/govcop1.pdf	3/99	Y	Provides a diagram for spreader minimum dimensions, transition to spreader must have 1% slope or less.	No Information Available
Watersheds, Water Quality Decision Support System, NCSU Water Quality Group, Web Site, h2osparc.wq.ncsu.edu		Y	Brief description of spreader siting.	No Information Available

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Document	Date Published	Information (Y/N)	Design Parameters	Effectiveness Assessment
Greater Vancouver Sewerage and Drainage District Stormwater Plan (http://www.gvrd.bc.ca/services/sewers/drain/Reports/best_mgmt_guide/Volume%202%20BMP%20Appendix%20H/vol2_6.6-6.9.pdf)		Y	1:2 ditch slope max. Gravel or board lip. Minimum spreader length 2 m (6'). Discharge into undisturbed, well vegetated areas.	No Information Available
Complying with the Edwards Aquifer Rules: Technical Guidance on Best Management Practices (http://www.tnrcc.state.tx.us/admin/topdoc/rg/348/)		Y	Construct on undisturbed soil. Release into area of less than 10% slope. Good details.	No Information Available
Maine Department of Environmental Protection BMP Manual (http://www.state.me.us/mdot/mainhtml/bmp/bmpjan2000.pdf)		Y	Minimum length is 3.7 m (12'). Use 0.023 m^3/s/m (0.25 cfs/f) for lip length. Discharge into undisturbed, well vegetated areas.	No Information Available
Center for Research in Water Resources, A Review and Evaluation of Literature Pertaining to the Quality and Control of Pollution From Highway Runoff and Construction, University of Texas at Austin Web Page, www.ce.utexas.edu/centers/crwr/reports/rpt95_5/rpt95-5.pdf.	4/1/95	N	No Information Available	No Information Available
EPA, Preliminary Data Summary of Urban Stormwater Best Management Practices, www.epa.gov/ost/stormwater	8/1/99	N	No Information Available	No Information Available
Stormwater Pollution Control Manual, Best Management Practices for Business and Government Agencies, Clark County Environmental Services Division, www.co.clark.wa.us/pubworks/BMPman.pdf	10/1/00	N	No Information Available	No Information Available

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SI® Geosolutions web page (http://www.fixsoil.com/stormwater/main.asp)		N	No Information Available	No Information Available
City of Los Angeles Stormwater Handbook/Construction Practices (http://www.lastormwater.org/)		N	No Information Available	No Information Available
Cal Trans Stormwater Quality Handbook Construction Site BMP Manual (http://www.dot.ca.gov/hq/construc/Construction_Site_BMPs.pdf)		N	No Information Available	No Information Available
Island County WA BMP practices (http://www.islandcounty.net/community/BMPs/BMP%20Handouts/)		N	No Information Available	No Information Available
Metropolitan Nashville and Davidson County Stormwater Management Manual (ftp://ftp.nashville.org/web/pw/bmp/)		N	No Information Available	No Information Available
Dekalb County Stormwater Management Manual (http://www.co.dekalb.ga.us/publicwrks/stormwater/toc.htm)		N	No Information Available	No Information Available
City of Honolulu BMP Manual (http://www.cleanwaterhonolulu.com/reports/BMP_manual.pdf)		N	No Information Available	No Information Available

TABLE 2

SITE SURVEY SUMMARY
LEVEL SPREADER EFFECTIVENESS EVALUATION

Site	Location	Review Date	Nature of Work	Existing Level Spreader (Y/N)	Qualified Level Spreader Site (Y/N)	Comments
05-MON-101-96.1	US 101 in Prunedale	7/25/01	Interchange Construction	N	N	The site is in a hilly area, and stormwater from the construction project does not discharge near any undisturbed moderate slopes.
05-SB-101-75.5	US 101, Gaviota Rest Stop	7/20/01	Construction of New Facilities at the Gaviota Rest Stop	N	N	Primarily a landscaping job during the 2001-2002 storm season.
05-SCR-1-18.2/19.7	US 1 in Santa Cruz	7/25/01	Street Improvements	N	N	All work is being performed on city streets. There are no areas suitable for a level spreader
05-SLO-101-32.3/35.5	US 101, San Luis Obispo County, North of Reservoir Canyon Road	7/19/01	Add Truck Passing Lane	N	N	Slopes are generally over 10% for the majority of the site. The discharge areas are in the path of the heavy equipment.
06-KER-58-107.7/118.0	US 58 near Mojave	7/24/01	Freeway Construction	N	N	The site would be difficult to monitor because it receives very little rainfall. Furthermore, the entire region is fairly flat.
07-LA-101-0.0/27.2	US 101	--	--	--	--	No disturbed soil areas (DSAs).
07-LA-10-42.4/48.3	US 10 in Pomona and Claremont	7/12/01	Freeway Widening	N	N	The site is relatively flat with no locations suitable for a level spreader. No native soil areas.
07-LA-105-13.7/17.3	US 105	--	--	--	--	No active DSAs
07-LA-105-9.6/10.0	US 105 near Los Angeles	7/12/01	Bridge Overcrossing Construction	N	N	This project is expected to be completed prior to the 2001-2002 rainy season.
07-LA-138-43.4/51.9	US 138	--	--	--	--	No active DSAs
07-LA-14-24.8/27.0	US 14 near Santa Clarita	7/24/01	HOV Lanes Construction	N	N	There are no DSAs at the construction site. Construction will be completed in 2-3 months. Yard area is expected to close by December 2001.

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Site	Location	Review Date	Nature of Work	Existing Level Spreader (Y/N)	Qualified Level Spreader Site (Y/N)	Comments
07-LA-14-44.01/54.5	US 14 near Palmdale	7/24/01	HOV Lanes Construction/Freeway Widening	N	N	There is no suitable location at the construction site because it lacks areas of undisturbed slopes. Runoff from the construction site is routed to a permanent, off-site outfall that discharges into an eroded stream bed. Runoff from the main yard area is also routed a permanent outfall that discharges to an off-site location at the outer slope of the on/off-ramp loop. The slope gradient is roughly 25% and flattens into an eroded streambed.
07-LA-30-2.3/5.4	Route 30, Los Angeles County in San Dimas	7/17/01	Freeway Construction	N	N	The site is predominately flat and there were no locations with undisturbed slopes suitable for a level spreader installation.
07-LA-30-5.4/7.8	Route 30, Los Angeles County in Claremont	7/17/01	Freeway Construction	N	N	The site is predominately flat and there were no locations with undisturbed slopes suitable for a level spreader installation.
07-LA-30-7.8/8.3	Route 30, Los Angeles County in Claremont and Upland	7/17/01	Freeway Construction	N	N	The site is predominately flat and there were no locations with a long undisturbed slope suitable for a level spreader installation.
07-LA-405-20.2/21.7	US 405 near Carson	7/11/01	Reconstruction of Ramps and Connectors	N	N	This project is expected to be completed prior to the 2001-2002 rainy season.
07-LA-405-37.0/39.0	US 405 near Sherman Oaks	7/11/01	Undercrossing/Auxiliary Lane Construction	N	N	The site is relatively flat with no locations suitable for a level spreader. No native soil areas.
07-LA-405-41.0/42.4	US 405 near Sherman Oaks	7/11/01	Undercrossing/Sound Wall Construction	N	N	The site is relatively flat with no locations suitable for a level spreader. No native soil areas.
07-LA-5-62.4	US 5 in Santa Clarita	7/12/01	Embankment Reconstruction	N	N	This project is not expected to last through the rainy season.
07-LA-5-64.0	US 5 in Santa Clarita	7/12/01	Retaining Wall Construction	N	N	This project is expected to be completed prior to the rainy season.
07-LA-5729	In LA County near City of Industry	--	--	--	--	No active DSAs

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Site	Location	Review Date	Nature of Work	Existing Level Spreader (Y/N)	Qualified Level Spreader Site (Y/N)	Comments
07-LA-710-6.8/9.7	US 710 near Carson	7/11/01	Freeway Resurfacing	N	N	The site is relatively flat with no locations suitable for a level spreader. No native soil areas.
07-Ven-1-15.0	Route 1, Ventura County in Oxnard	7/20/01	Interchange Modification	N	N	The site is predominately flat and there were no locations with a long undisturbed slope suitable for a level spreader installation.
08-RIV-215-38.4/41.5	US 215 near Riverside and Moreno Valley	7/13/01	Freeway Widening	N	N	The site is relatively flat with no locations suitable for a level spreader. No native soil areas.
08-RIV-71-2.6/3.0	US 71 near Corona	7/17/01	Bridge Widening	N	N	Currently the site is an on ramp from the 71 to the 91 freeway. The site contains slopes that slope away from the on ramp to the Santa Ana River. As the slope grades down to a low angle, it flows into a native soil area that would be good for this BMP. Unfortunately, the discharge location drains an area larger than the design maximum.
08-SBD-10-15.4/16.9	US 10 near Fontana	7/20/01	Overcrossing/Interchange Construction	N	N	No native soil areas and no concentrated flow areas.
08-SBD-15-160.7/162.5	US 15 near Stateline, NV	7/25/01	Bridge Replacement/ Freeway Widening	N	N	The site is relatively flat with no locations suitable for a level spreader. No native soil areas.
08-SBD-30-10.7/14.2	Route 30, San Bernardino County in Fontana and Rancho Cucamonga	7/17/01	Freeway Construction	N	N	The site is predominantly flat and there were no locations with undisturbed slopes suitable for a level spreader installation.
09-INY-395-90.9/99.6	US 395 near Big Pine	7/18/01	Freeway Widening	N	N	The site is predominantly flat and there were no locations with undisturbed sloped suitable for a level spreader installation.
09-INY-5716	In Inyo County near Shoshone	--	--	--	--	No active DSAs
09-KER-5721	In Kern County near Inyokern	--	--	--	--	No active DSAs

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Site	Location	Review Date	Nature of Work	Existing Level Spreader (Y/N)	Qualified Level Spreader Site (Y/N)	Comments
09-MNO-395-44.5/51.3	US 395 near Lee Vining	7/18/01	Freeway Widening	N	N	Most site grading is complete and the site is predominantly flat. There were no locations with undisturbed slopes suitable for a level spreader installation. The project is inactive during the winter months.
11-IMP-111-8.0/12.9	US 111 near El Centro	--	--	--	--	Could not contact the RE to review.
11-SD-125-12.1/13.7	US 125 near Lemon Grove	7/18/01	Freeway Construction	N	N	The site contained no locations suitable for a level spreader. No native soil areas.
11-SD-125-13.7/14.0	US 125 near Lemon Grove	7/18/01	Freeway Construction	N	N	The site contained no locations suitable for a level spreader. No native soil areas.
11-SD-125-19.0/21.3	US 125 near San Diego, La Mesa, El Cajon, and Santee	7/18/01	Freeway Construction	N	N	Work is not anticipated for another year.
11-SD-15-27.3/33.6	US 15 near Escondido	7/18/01	Undercrossing and Median Barrier Construction	N	N	This project is expected to be completed prior to the rainy season.
11-SD-8-26.4/32.0	US 8 near Alpine	7/24/01	Bridge Widening and Seismic Retrofit	N	N	Currently the site slopes down into Viejas Creek. It flows into a native soil area prior to entering the Creek. The area of the site downstream of an existing sediment control BMP does not meet the design criteria for conveyance structure length and slope.
12-ORA-1-29.9/33.7	US 1	--	--	--	--	No active DSAs
12-ORA-55-14.4/15.6	US 55 in Orange	7/13/01	Undercrossing Construction and Freeway Widening	N	N	Project was completed ahead of schedule
12-ORA-73-6.6	Toll Road 73	--	--	--	--	Project was completed ahead of schedule